

# INTERNATIONAL STANDARD

**ISO  
9402**

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## **Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Full peripheral magnetic transducer/flux leakage testing of ferromagnetic steel tubes for the detection of longitudinal imperfections**

*Tubes en acier sans soudure et soudés (sauf à l'arc immergé) pour service sous  
pression — Contrôle par flux de fuite à l'aide de palpeurs magnétiques sur toute la  
circonférence des tubes d'aciers ferromagnétiques pour la détection des  
imperfections longitudinales*



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## Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 9402 was prepared by Technical Committee ISO/TC 17, *Steel*.

Annex A of this International Standard is for information only.

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## Introduction

This International Standard concerns full peripheral magnetic transducer/flux leakage testing of seamless and welded (except submerged arc-welded) ferromagnetic steel tubes for pressure purposes for the detection of longitudinal imperfections.

Three different acceptance levels are considered (see table 1). The choice between these acceptance levels is within the province of the ISO Technical Committee responsible for the development of the relevant quality standards.

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# Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Full peripheral magnetic transducer/flux leakage testing of ferromagnetic steel tubes for the detection of longitudinal imperfections

## 1 Scope

**1.1** This International Standard specifies requirements for full peripheral magnetic transducer/flux leakage testing of seamless and welded ferromagnetic steel tubes for pressure purposes, with the exception of submerged arc-welded (SAW) tubes, for the detection of longitudinal imperfections, according to three different acceptance levels (see table 1).

**1.2** This International Standard has been prepared with the knowledge that magnetic transducer/flux leakage testing has technical limitations in that the sensitivity of the test is at a maximum at the tube surface adjacent to the magnetic transducer and decreases with increasing tube thickness. As a result this standard recognizes that above certain tube thicknesses for a given acceptance level, it is necessary for the internal notch depth to be increased in excess of that specified for the external notch by an amount to be agreed between purchaser and manufacturer (see annex A).

**1.3** This International Standard is applicable to the inspection of tubes with an outside diameter greater than or equal to 9 mm.

## 2 General requirements

**2.1** The magnetic transducer/flux leakage inspection covered by this International Standard is usually carried out on tubes after completion of all the production process operations.

This inspection shall be carried out by suitably trained operators and supervised by competent personnel nominated by the manufacturer. In the case of third-party inspection, this shall be agreed between the purchaser and manufacturer.

**2.2** The tubes to be tested shall be sufficiently straight to ensure the validity of the test. The surfaces shall be sufficiently free from foreign matter which would interfere with the validity of the test.

## 3 Method of test

**3.1** The tube shall be tested using a magnetic transducer/flux leakage technique for the detection of predominantly longitudinal imperfections. See figure 1.

No limits on thickness are specified, but it is emphasized that the effectiveness of the technique decreases with increasing thickness (see 1.2 and annex A).

**3.2** During testing, the tubes and/or the transducer assembly shall be moved relative to each other so that the whole of the tube surface is scanned.

NOTE — It is recognized that there is a short length at both tube ends which may not be able to be tested.

**3.3** The maximum width of each individual transducer, measured parallel to the major axis of the tube, shall be 30 mm.

**3.4** The equipment for automatic testing shall be capable of differentiating between acceptable and suspect tubes by means of an automatic trigger/alarm level combined with a marking and/or sorting system.

## 4 Reference standards

**4.1** The reference standards defined in this International Standard are convenient standards for calibration of non-